Practical-6

Date: 29-03-2024

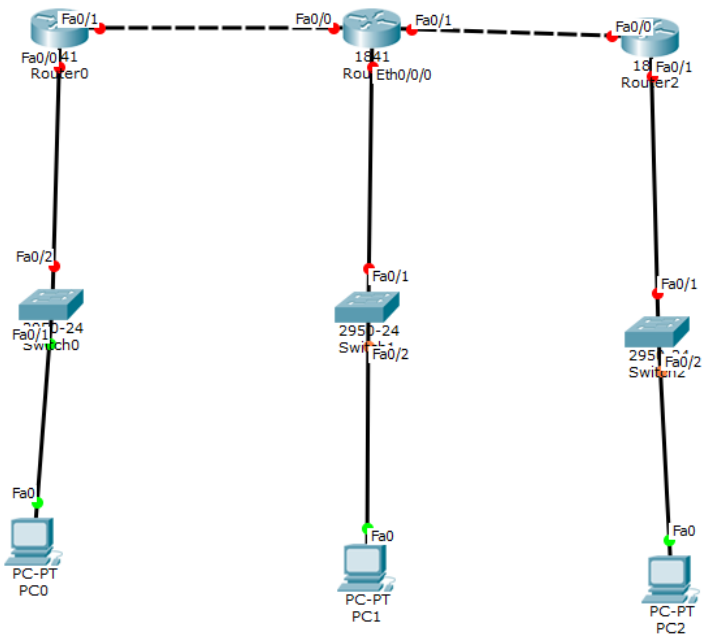
AIM: Understand & identify Packet(L3) & frame(L2) content detail.

Tools required:

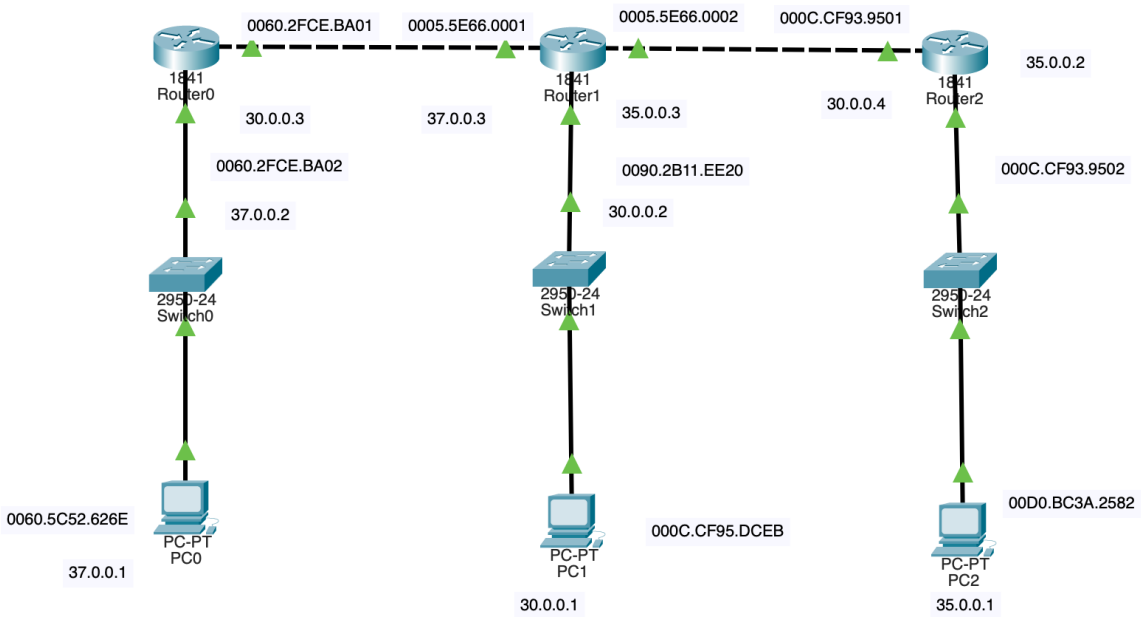
1. Desktop Computer
2. Cisco Packet Tracer

Note: While applying IP address, student need to allocate IP address as per his/her student ID. For Example, if student ID is 20ce005 then IP address allocation for first network should start with 5.0.0.0. For subsequent network, it should start with ID+1 i.e. 6.0.0.0, 7.0.0.0. and so on.

Submission: After writing answer into this word document, Student need to change name to his ID followed by practical number. Ex 20ce005_Pr1.docx. Upload on assignment segment.
Rubrics: Nicely drafted document with clarity in answers leads to full marks. Otherwise, submission carries proportional mark.
copy-past from cisco packet tracker is permitted.



Topology for the consideration



Steps:

1. Create topology in Realtime mode
2. Configure IP address
3. Configure Static Routing in Each routers
4. Ping from PC0 to rest other PCs and all interface of routers and fill success table
5. Go to Simulation mode
6. Prepare MAC and IP address Table.
7. Prepare ARP table for all PCs
8. Prepare Routing tables for Router0, Router1 and Router2
9. Prepare ARP tables for Router0, Router1 and Router2
10. Prepare MAC table of all switches
11. In simulation mode follow instructions as given in exercise and write answer of questions.

Destination machine	**Destination IP address**	**Command**	**Success/Fail**
FE0/0 of Router0	30.0.0.3	Ping 30.0.0.3	Success
FE0/1 of Router0	37.0.0.2	Ping 37.0.0.2	Success
FE0/0 of Router1	37.0.0.3	Ping 37.0.0.3	Success
FE0/1 of Router1	35.0.0.3	Ping 35.0.0.3	Success
FE0/0/0 of Router1	30.0.0.2	Ping 30.0.0.2	Success
PC1	30.0.0.1	Ping 30.0.0.1	Success
FE0/0 of Router2	30.0.0.4	Ping 30.0.0.4	Success
FE0/1 of Router2	35.0.0.2	Ping 35.0.0.2	Success

PC2	35.0.0.1	Ping 35.0.0.1	Success

Ping Success table

Ping from PC0 to PC2 and attach a snapshot for the same.

```
C:\>ping 35.0.0.1

Pinging 35.0.0.1 with 32 bytes of data:

Reply from 30.0.0.2: Destination host unreachable.
Reply from 30.0.0.2: Destination host unreachable.
Reply from 30.0.0.2: Destination host unreachable.
Request timed out.

Ping statistics for 35.0.0.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>arp -a
  Internet Address      Physical Address      Type
  30.0.0.2              0090.2b11.ee20        dynamic
```

Computer/Router Interface	**MAC address**	**IP address**
PC0	0060.5C52.626E	37.0.0.1
Router0 FE0/0	0060.2FCE.BA02	10.0.0.1
Router0 FE0/1	0060.2FCE.BA01	37.0.0.2
Router1 FE0/0	0005.5E66.0001	10.0.0.2
Router1 FE0/1	0005.5E66.0002	11.0.0.1
Router1 ETH0/0/0	0090.2B11.EE20	30.0.0.2
PC1	000C.CF95.DCEB	30.0.0.1
Router2 FE0/0	000C.CF93.9501	11.0.0.2
Router2 FE0/1	000C.CF93.9502	35.0.0.2
PC2	00D0.BC3A.2582	35.0.0.1

MAC and IP address Table

ARP Table for PC0

```
C:\>arp -a
  Internet Address      Physical Address      Type
  37.0.0.2              0060.2fce.ba02        dynamic
```

ARP Table for PC1

```
C:\>arp -a
  Internet Address      Physical Address      Type
  30.0.0.2              0090.2b11.ee20        dynamic
```

ARP Table for PC2

```
C:\>arp -a
  Internet Address      Physical Address      Type
  35.0.0.2              000c.cf93.9502        dynamic
```

Routing table for Router0

```
Device Name: Router0
Device Model: 1841
Hostname: Router

Port              Link   VLAN   IP Address        IPv6 Address                MAC Address
FastEthernet0/0   Up     --     10.0.0.1/8        <not set>                   0060.2FCE.BA01
FastEthernet0/1   Up     --     37.0.0.2/8        <not set>                   0060.2FCE.BA02
Vlan1             Down   1      <not set>         <not set>                   0060.47CD.1677

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router0
```

Routing table for Router1

```
Device Name: Router1
Device Model: 1841
Hostname: Router

Port              Link   VLAN   IP Address        IPv6 Address                MAC Address
FastEthernet0/0   Up     --     10.0.0.2/8        <not set>                   0005.5E66.0001
FastEthernet0/1   Up     --     11.0.0.1/8        <not set>                   0005.5E66.0002
Ethernet0/1/0     Up     --     30.0.0.2/8        <not set>                   0090.2B11.EE20
Vlan1             Down   1      <not set>         <not set>                   000A.4103.AC1C

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router1
```

Routing table for Router2

```
Device Name: Router2
Device Model: 1841
Hostname: Router

Port              Link   VLAN   IP Address        IPv6 Address                MAC Address
FastEthernet0/0   Up     --     11.0.0.2/8        <not set>                   000C.CF93.9501
FastEthernet0/1   Up     --     35.0.0.2/8        <not set>                   000C.CF93.9502
Vlan1             Down   1      <not set>         <not set>                   00D0.978C.47A5

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router2
```

IP Address	MAC Address	Interface
37.0.0.2	0060.2FCE.BA01	Dynamic
10.0.0.1	0060.2FCE.BA02	Dynamic

ARP Table for Router0

IP Address	MAC Address	Interface
10.0.0.2	0005.5E66.0001	Dynamic
11.0.0.1	0005.5E66.0002	Dynamic

ARP Table for Router1

IP Address	MAC Address	Interface
11.0.0.2	000C.CF93.9501	000C.CF93.9501
35.0.0.2	000C.CF93.9502	000C.CF93.9502

ARP Table for Router2

Switching table for Switch0

```
Device Name: Switch0
Device Model: 2950-24
Hostname: Switch

Port              Link   VLAN   IP Address        MAC Address
FastEthernet0/1   Up     --     --                0001.42EA.1A01
FastEthernet0/2   Up     --     --                0001.42EA.1A02
```

Switching table for Switch1

```
Device Name: Switch1
Device Model: 2950-24
Hostname: Switch

Port               Link   VLAN   IP Address         MAC Address
FastEthernet0/1    Up     --     --                 0000.0C5E.0201
FastEthernet0/2    Up     --     --                 0000.0C5E.0202
```

Switching table for Switch2

```
Device Name: Switch2
Device Model: 2950-24
Hostname: Switch

Port               Link   VLAN   IP Address         MAC Address
FastEthernet0/1    Up     --     --                 0005.5E13.9B01
FastEthernet0/2    Up     --     --                 0005.5E13.9B02
```

In simulation mode

Exercise-1: Ping from PC0 to FE0/0 of Router0

click on capture forward once so packet goes to switch, Inspect& write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0060.2FCE.BA02	0060.2FCE.BA02
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	10.0.0.1	10.0.0.1

Question: What decision will be taken by switch?

Answer: It will send packet to given MAC Address.

Exercise-2: Ping from PC0 to FE0/1 of Router0

Click on capture forward once so packet goes to switch, Inspect& write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0060.2FCE.BA01	0060.2FCE.BA01
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	37.0.0.2	37.0.0.2

Question: Is there any difference between table content of exercise-1 and 2? Why?

Answer: No, Because the destination is Same.

Exercise-3: Ping from PC0 to FE0/0 of Router1

Click on capture forward once so packet goes to switch, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0005.5E66.0001	0005.5E66.0001
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	10.0.0.2	10.0.0.2

Question: What decision will be taken by Router0?

Answer: Router0 will forward the msg.

Question: Is Inbound and outbound PDU detail remain same? If not why?

Answer: Yes.

Exercise-4: Ping form PC0 to PC1 (For even roll number of student PC0 to PC2)

Click on capture forward so packet goes to switch0, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	000C.CF95.DCEB	000C.CF95.DCEB
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	30.0.0.1	30.0.0.1

Click on capture forward so packet goes to Router0, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0060.2FCE.BA02	0060.2FCE.BA02
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	10.0.0.1	10.0.0.1

Click on capture forward so packet goes to Router1, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0005.5E66.0001	0005.5E66.0001
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	10.0.0.2	10.0.0.2

Click on capture forward so packet goes to switch1, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0005.5E66.0001	0005.5E66.0001
Destination MAC address	0000.0C5E.0201	0000.0C5E.0201
Source IP Address	10.0.0.2	10.0.0.2
Destination IP address	30.0.0.1	30.0.0.1

Click on capture forward so packet goes to PC1, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0060.2FCE.BA01	0060.2FCE.BA01
Source IP Address	30.0.0.1	30.0.0.1

Destination IP address	30.0.0.2	30.0.0.2

Click on capture forward so packet goes to switch1, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0005.5E66.0001	0005.5E66.0001
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	10.0.0.2	10.0.0.2

Click on capture forward so packet goes to Router1, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0005.5E66.0001	0005.5E66.0001
Destination MAC address	0000.0C5E.0201	0000.0C5E.0201
Source IP Address	10.0.0.2	10.0.0.2
Destination IP address	30.0.0.1	30.0.0.1

Click on capture forward so packet goes to router0, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0060.2FCE.BA02	0060.2FCE.BA02
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	10.0.0.1	10.0.0.1

Click on capture forward so packet goes to switch0, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0060.5C52.626E	0060.5C52.626E
Destination MAC address	0005.5E66.0001	0005.5E66.0001
Source IP Address	37.0.0.1	37.0.0.1
Destination IP address	10.0.0.2	10.0.0.2

Click on capture forward so packet goes to PC0, Inspect & write Inbound and Outbound PDU and fill following table

	In Bound	**Out Bound**
Source MAC Address	0005.5E66.0001	0005.5E66.0001
Destination MAC address	0000.0C5E.0201	0000.0C5E.0201
Source IP Address	10.0.0.2	10.0.0.2
Destination IP address	30.0.0.1	30.0.0.1

Observe/inspect values of above tables and answer following questions.

Question: Is Source IP and Destination IP remains same for one way of data transmission?

Answer: No, it changes.

Justify: In reverse direction, source IP and destination IP address gets changed.

Answer: Yes it get change.

=Gate Questions :

1. **Which of the following functionality must be implemented by a transport protocol over and above the network protocol?**
   A) Recovery from packet losses
   B) Detection of duplicate packets
   C) Packet delivery in the correct order
   D) End to end connectivity
   Ans. **D) End to end connectivity**

2. **Choose the best matching between Group 1 and Group 2**

Group-1	Group-2
P. Data link layer	1.Ensures reliable transport of data over a physical point-to-point link
Q. Network layer	2.Encodes/decodes data for physical transmission
R. Transport layer	3.Allows end-to-end communication between two processes
	4. Routes data from one network node to the next

   A) P-1, Q-4, R-3
   B) P-2, Q-4, R-1
   C) P-2, Q-3, R-1
   D) P-1, Q-3, R-2
   Ans. **A) P-1, Q-4, R-3**

3. **Match the following:**

A. SMTP	1. Application Layer
B. BGP	2. Transport Layer
C. TCP	3. Data Link Layer
D. PPP	4. Network Layer
	5. Physical Layer

   A) A - 2, B - 1, C - 3, D - 5
   B) A - 1, B - 4, C - 2, D - 3
   C) A - 1, B - 4, C - 2, D - 5
   D) A - 2, B - 4, C - 1, D – 3
   Ans. **B) A-1, B-4, C-2, D-3**

4. **Assume that source S and destination D are connected through two intermediate routers labeled R. Determine how many times each packet has to visit the network layer and the data link layer during a transmission from S to D.**
   A) Network layer – 4 times and Data link layer – 4 times
   B) Network layer – 4 times and Data link layer – 3 times
   C) Network layer – 4 times and Data link layer – 6 times
   D) Network layer – 2 times and Data link layer – 6 times
   Ans. **C) Network layer – 4 times and Data link layer – 6 times**

5. **In the following pairs of OSI protocol layer/sub-layer and its functionality, the INCORRECT pair is**
   A) Network layer and Routing
   B) Data Link Layer and Bit synchronization
   C) Transport layer and End-to-end process communication
   D) Medium Access Control sub-layer and Channel sharing
   Ans. **B) Data Link Layer and Bit synchoronization**

6. **Match the following:**

Field	Length in bits
(P).UDP Header's Port Number	I. 48
(Q).Ethernet MAC Address	II. 8
(R).IPv6 Next Header	III. 32
(S).TCP Header's Sequence Number	IV. 16

   A) P-III, Q-IV, R-II, S-I
   B) P-II, Q-I, R-IV, S-III
   C) P-IV, Q-I, R-II, S-III
   D) P-IV, Q-I, R-III, S-II
   Ans. **C) P-IV, Q-I, R-II, S-III**

7. **Which of the following is NOT true with respect to a transparent bridge and a router?**
   A) Both bridge and router selectively forward data packets
   B) A bridge uses IP addresses while a router uses MAC addresses
   C) A bridge builds up its routing table by inspecting incoming packets
   D) A router can connect between a LAN and a WAN
   Ans. **B) A bridge uses IP addresses while a router uses MAC address.**

8. **Which of the following is TRUE about the interior gateway routing protocols – Routing Information Protocol (RIP) and Open Shortest Path First (OSPF)**
   A) RIP uses distance vector routing and OSPF uses link state routing
   B) OSPF uses distance vector routing and RIP uses link state routing
   C) Both RIP and OSPF use link state routing
   D) Both RIP and OSPF use distance vector routing
   Ans. **A) RIP uses distance vector routing and OSPF uses link state routing**

9. **An IP router implementing Classless Inter-domain Routing (CIDR) receives a packet with address 131.23.151.76 . The router's routing table has the following entries:**

Prefix	Outer Interface Identifier
131.16.0.0/12	3
131.28.0.0/14	5
131.19.0.0/16	2
131.22.0.0/15	1

   The identifier of the output interface on which this packet will be forwarded is _____.
   Ans. 1

10. Consider the following statements about the routing protocols. Routing Information Protocol (RIP) and Open Shortest Path First (OSPF) in an IPv4 network.

I. RIP uses distance vector routing
II. RIP packets are sent using UDP
III. OSPF packets are sent using TCP
IV. OSPF operation is based on link-state routing

Which of the above statements are CORRECT?

A) I and IV only
B) I, II and III only
C) I, II and IV only
D) II, III and IV only

Ans. **C) I, II and IV only**

11. Consider the following statements about the functionality of an IP based router.

I. A router does not modify the IP packets during forwarding.
II. It is not necessary for a router to implement any routing protocol.
III. A router should reassemble IP fragments if the MTU of the outgoing link is larger than the size of the incoming IP packet.

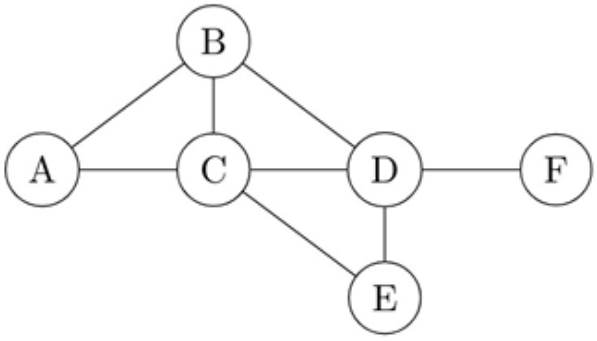
Which of the above statements is/are TRUE?

A) I and II only
B) I only
C) II and III only
D) II only

Ans. **II only**

12. Consider a simple graph with unit edge costs. Each node in the graph represents a router. Each node maintains a routing table indicating the next hop router to be used to relay a packet to its destination and the cost of the path to the destination through that router. Initially, the routing table is empty. The routing table is synchronously updated as follows. In each updated interval, three tasks are performed.

I. A node determines whether its neighbours in the graph are accessible. If so, it sets the tentative cost to each accessible neighbour as 1. Otherwise, the cost is set to ∞.
II. From each accessible neighbour, it gets the costs to relay to other nodes via that neighbour (as the next hop).
III. Each node updates its routing table based on the information received in the previous two steps by choosing the minimum cost.



For the graph given above, possible routing tables for various nodes after they have stabilized, are shown in the following options. Identify the correct table.

A.

A	-	-
B	B	1
C	C	1
D	B	3
E	C	3
F	C	4

Table for node A

B.

A	A	1
B	B	1
C	-	-
D	D	1
E	E	1
F	E	3

Table for node C

C.

A	A	1
B	-	-
C	C	1
D	D	1
E	C	2
F	D	2

Table for node B

D.

A	B	3
B	B	1
C	C	1
D	-	-
E	E	1
F	F	1

Table for node D

Ans. **A)**

13. A group of 15 routers is interconnected in a centralized complete binary tree with a router at each tree node. Router i communicates with router j by sending a message to the root of the tree. The root then sends the message back down to router j. The mean number of hops per message, assuming all possible router pairs are equally likely is

A) 3
B) 4.26
C) 4.53
D) 5.26

Ans. **C)5.26**

14. Two popular routing algorithms are Distance Vector(DV) and Link State (LS) routing. Which of the following are true?

(S1): Count to infinity is a problem only with DV and not LS routing
(S2): In LS, the shortest path algorithm is run only at one node
(S3): In DV, the shortest path algorithm is run only at one node
(S4): DV requires lesser number of network messages than LS

A) S1, S2 and S4 only
B) S1, S3 and S4 only
C) S2 and S3 only
D) S1 and S4 only

Ans. **D) S1 and S4 only**